

Amendments to the Drawings

According to the Office Action, Figures 1-8 as originally filed are informal and Corrected Drawings are required with this Response. Accordingly, Corrected Drawings for Figures 1-8 are attached hereto. Figures 1-8 are in compliance with 37 C.F.R. §§ 1.84 and 1.121(d).

In addition, attached Figures 1, 2, and 6 differ from originally filed Figures 1, 2, and 6 to merely correct formal matters as follows:

Reference character 85 is added to Figure 1. Support for this amendment can be found in the specification at, e.g., page 12, line 28.

Reference character 94 is added to Figure 1. Support for this amendment can be found in the specification at, e.g., page 12, line 31.

Reference character 96 is added to Figure 1. Support for this amendment can be found in the specification at, e.g., page 13, line 2.

Reference character 135 is added to Figure 1. Support for this amendment can be found in the specification at, e.g., page 13, line 1.

Reference character 143 is added to Figure 1. Support for this amendment can be found in the specification at, e.g., page 13, line 2.

Reference character 151 is added to Figure 1. Support for this amendment can be found in the specification at, e.g., page 12, line 30.

Reference character 68 is deleted from Figure 2 as it is redundant with reference character 67.

The lead line for reference character 187 is properly extended to the exterior side region of post 184 in Figure 6. Support for this amendment can be found in the specification at, e.g., page 15, line 20.

Remarks

Applicants respectfully request reconsideration and further examination of the application in view of the amendments above and remarks below.

This Response to Non-Final Office Action includes amendments to the claims, specification, and drawings.

It is respectfully submitted that the amendments to the application (i.e., claims, specification, and drawings) are fully supported by the application as originally filed and that such amendments do not present new matter.

Claims 1-20 are pending in the above-identified patent application. With this Response, claims 1, 5, 12, 13, 15, and 16 are amended; claims 2, 4, 6, 8, 14, 17, and 19 are canceled; and new claims 21-24 are added. Upon entry of the current amendments, claims 1, 3, 5, 7, 9-13, 15, 16, 18, and 20-24 are pending.

Support for the claim amendments and the new claims is discussed below.

Support for the amendments to the specification is discussed above in the Amendments to the Specification section.

Support for the amendments to the drawings is discussed above in the Amendments to the Drawings section.

Fees for Added Claims

It is respectfully submitted that a fee of \$200.00 is due for an additional independent claim (i.e., new claim 24) in excess of three, and that no additional claims fee is due for total claims in excess of twenty because of claims canceled with this Response and previously paid for.

It is believed that no other fees for adding claims are required in filing this Response. However, if any other fee(s) are required for adding claims, please charge the appropriate fee(s) to the Kagan Binder Deposit Account No. 50-1775 and notify us of the same.

Discussion of Claim Amendments and New Claims

Independent Claims 1, 5, 13, and 16

Independent claims 1, 5, 13, and 16 are each amended to feature that at least one unlubricated bearing is used to couple the rotor to the housing in manner such that the unlubricated bearing is in fluid communication with the drain pathway. Support for these amendments can be found in the specification at, e.g., page 10, lines 15 and 16; page 12, lines 9-12; and Figures 1 and 5-7.

As can be seen in, e.g., Figures 1 and 5, bearing 113 is in fluid communication with drain pathway 170 meaning that process fluid draining through drain pathway 170 could contact bearing 113 under certain circumstances. For example, process fluid draining through drain pathway 170 could contact bearing 113 if gap 156 were to overfill with process fluid.

An unlubricated bearing can act as a trap to help direct process fluid to drain 35 and/or can allow process fluid to flow into or through the bearing if need be. In contrast to lubricated bearings, an unlubricated bearing is much less of a concern with respect to contaminating the process fluid stream exiting the rotary union and that is to be delivered to the process environment. That is, sometimes drain fluid can be caused to backflow and enter the process fluid stream towards the process. If the process fluid that backflows is contaminated from the lubrication of bearings, that contamination could undesirably be directed towards the process.

Advantageously, positioning an unlubricated bearing in fluid communication with the drain pathway has significant use advantages such as:

- allowing the rotary union to be more simple in design, yet appropriate for processes sensitive to contamination; and
- allowing the bearing or bearing(s) to be more appropriately placed between the rotor and housing so as to improve rotational stability and/or better maintain extremely tight tolerance(s) between parts that rotate relative to each other.

For example, Applicant's rotary union 20 can be considered relatively simple in design because rotary union does not need to be isolated from drain pathway 170 via a mechanical seal (see, e.g., ring seal 14 of the Zierden et al. reference) and/or a pneumatic air seal (see, e.g., port 38 of the Miwa reference or compressed air passage 45 of the Takada

reference). Yet, rotary union 20 is perfectly acceptable for sensitive processing environments such as those for processing microelectronic devices, medical devices, and the like.

Independent claim 16 is also amended to clarify that the fluid conveyed into the rotary union is drained away via the drain pathway. Support for this amendment can be found throughout the specification.

Dependent claims 12 and 21

Dependent claim 12 and new dependent claim 21 are directed to a method of using a rotary union and each of claims 12 and 21 feature that a portion of the process fluid entering the rotary union is drained via the drain pathway while process fluid is being delivered to the rotating point of use. Support for this subject matter can be found at, e.g., Figures 1, 5, 6, and 7, and related text.

Dependent claim 15

Claim 15 is merely amended to correct claim dependency.

New dependent claims 22 and 23

Dependent claims 22 and 23 each feature that the rotary union is used in a microelectronic device process and a medical device process, respectively, which are contamination sensitive processes. Support for this subject matter can be found in the specification at, e.g., page 3, line 17-21.

New independent claim 24

New independent claim 24 features two unlubricated bearings that are spaced apart such that the first bearing is approximately coplanar with one end of the post and the second bearing is approximately coplanar with the other end of the post. Claim 24 also features:

- an annular gap that is between the post and the rotor and extends along the length of the post that is adjacent to the rotor; and
- an annular gap that is between the spacer and the rotor and extends along the length of the spacer.

Advantageously, using two unlubricated bearings as featured in claim 24 allows the bearings to be spaced apart in a manner that can enhance rotational stability of the rotary union and/or maintain the gaps formed among the post, rotor, and spacer.

Support for new claim 24 can be found at, e.g., page 4, lines 4-30, and Figure 1 and its associated text.

Claim Rejections - 35 U.S.C. § 102

Claims 1, 2, 5, 6, 9, 11, 12, 16, 17 and 20 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Zierden et al. (U.S. Pat. No. 4,313,624).

Applicants respectfully submit that this rejection is overcome by amendment to each independent claim 1, 5, and 16, to each feature at least one unlubricated bearing that is in fluid communication with the drain fluid pathway.

Zierden et al. does not necessarily teach to use unlubricated bearings. Indeed, the Office Action did rely on Zierden et al. to reject the unlubricated bearing subject matter of previously pending dependent claims 4, 8, and 19.

Moreover, Zierden et al. does not teach, motivate, or suggest to allow their bearing 12 to be in fluid communication with their vent passage 37. To the contrary, Zierden et al. take several measures to prevent a process fluid flowing through their swivel cartridge 10 from contacting their ball bearing 12. At column 2, lines 42-65, Zierden et al. describe using ring seal 14 to prevent fluid from flowing through clearance 36. Also, at column 3, lines 10-27, Zierden et al. explain that ball bearing 12 is positioned above the fluid seal formed by ring seal 14 so that when the ring seal fails process fluid cannot enter ball bearing 12.

Accordingly, it is respectfully requested that the rejection of claims 1, 2, 5, 6, 9, 11, 12, 16, 17 and 20 under 35 U.S.C. § 102(b) as being anticipated by Zierden et al. be withdrawn.

Claims 13-14 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Miwa (U.S. Pat. No. 5,058,927).

It is respectfully submitted that this rejection is overcome by amendment to independent claim 13 to feature at least one unlubricated bearing that is in fluid communication with the drain fluid pathway.

Miwa does not even remotely teach, motivate, or suggest allowing Miwa's bearings 7 or 8 to be in fluid communication with the drain paths leading to drain holes 18, 26, or 26'. To the contrary, Miwa explains that compressed air is introduced via port 38 so as to not allow a process fluid to be able to contact bearing 8 (see Miwa at, e.g., col. 4, lines 55-63; col. 5, lines 26-34 and 49; and col. 6, lines 11-28).

Accordingly, it is respectfully requested that the rejection of claims 13-14 under 35 U.S.C. § 102(b) as being anticipated by Miwa be withdrawn.

Claim Rejections - 35 U.S.C. § 103

Claims 3, 4, 7, 8, 18 and 19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Zierden et al. in view of Katsuhiko et al. (JP-11101250).

It is respectfully submitted that this rejection of these claims is overcome by amendment to base claims 1, 5, and 16, to each feature at least one unlubricated bearing that is in fluid communication with the drain fluid pathway.

As discussed above in rejection of base claims 1, 5, and 16, under §102 over Zierden et al., Zierden et al. fail to teach, motivate, or suggest to allow their bearing 12 to be in fluid communication with their vent passage 37 because Zierden et al. take several measures to prevent a process fluid flowing through their swivel cartridge 10 from contacting their ball bearing 12.

Katsuhiko et al. fail to cure the deficiencies of the Zierden et al. reference as the Katsuhiko et al. reference merely discloses a particular ball bearing. Katsuhiko et al. do not even remotely mention a rotary union, much less the relation of a ball bearing to a drain pathway in a rotary union.

In addition, with respect to a bearing being unlubricated, to the extent the Office Action takes Official Notice of an unlubricated bearing in a rotary union Applicants traverse such assertion of Official Notice by the Office Action.

The Office Action merely concludes that it would have been obvious to include an unlubricated bearing in a rotary union if lubrication is not desired. Such a summary conclusion, without any technical reasoning, fails to support Official Notice of a bearing being unlubricated in a rotary union.

Lubrication can help a bearing operate properly in a rotary union, which typically operates at high rotational speeds. Zierden et al. noted that water containing detergent may enter a ball bearing and dissolve the grease which can cause a rotary union to fail (see Zierden et al. at col. 3, lines 10-27). However, Zierden et al. do not suggest using unlubricated bearings. Instead, as discussed above, Zierden et al. go to great lengths to keep process fluid away from the bearings. That is, Zierden et al. use a ring seal and position the bearing above the ring seal so that process fluid cannot enter the ball bearing.

Accordingly, the Office Action's assertion of Official Notice cannot stand.

It is respectfully requested that the rejection of claims 3, 4, 7, 8, 18 and 19 under 35 U.S.C. §103(a) as being unpatentable over Zierden et al. in view of Katsuhiko et al. be withdrawn.

Claim 15 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Miwa in view of Katsuhiko et al.

It is respectfully submitted that this rejection of these claims is overcome by amendment to base claim 13 to feature at least one unlubricated bearing that is in fluid communication with the drain fluid pathway.

As discussed above in rejection of base claim 13 under §102 over Miwa, Miwa fails to teach, motivate, or suggest allowing Miwa's bearings 7 or 8 to be in fluid communication with the drain paths leading to drain holes 18, 26, or 26', as Miwa explains that compressed air is introduced via port 38 so as to not allow a process fluid to be able to contact bearing 8 (see Miwa at, e.g., col. 4, lines 55-63; col. 5, lines 26-34 and 49; and col. 6, lines 11-28).

Katsuhiko et al. fail to cure the deficiencies of the Miwa reference as the Katsuhiko et al. reference merely discloses a particular ball bearing. Katsuhiko et al. do not even remotely mention a rotary union, much less the relation of a ball bearing to a drain pathway in a rotary union.

Accordingly, it is respectfully requested that the rejection of claim 15 under 35 U.S.C. §103(a) as being unpatentable over Miwa in view of Katsuhiko et al. be withdrawn.

Claim 10 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Zierden et al. in view of Takeda (U.S. Pat. No. 5,203,592).

It is respectfully submitted that this rejection of claim 10 is overcome by amendment to base claim 5 to feature at least one unlubricated bearing that is in fluid communication with the drain fluid pathway.

As discussed above, Zierden et al. fail to teach, motivate, or suggest to allow their bearing 12 to be in fluid communication with their vent passage 37.

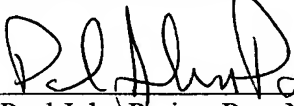
Takada fails to cure the deficiencies of the Zierden et al. reference. Takada does not even remotely teach, motivate, or suggest allowing Takada's bearing 3 to be in fluid communication with the drain paths leading to drain holes 33 or 63. To the contrary, similar to Miwa, Takada explains that compressed air is introduced via passage 45 so as to not allow a process fluid to be able to advancing into bearing 3 (see Takada at, e.g., col. 3, lines 64-66; col. 5, lines 26-40; and col. 6, lines 3-15).

Accordingly, it is respectfully requested that the rejection of claim 10 under 35 U.S.C. §103(a) as being unpatentable over Zierden et al. in view of Takeda be withdrawn.

Approval of the application and allowance of the claims is earnestly solicited. In the event that a phone conference between the Examiner and the Applicant's undersigned attorney would help resolve any issues in the application, the Examiner is invited to contact said attorney at (651) 275-9831.

Respectfully Submitted,

Dated: November 20, 2006

By: 
Paul John Parins, Reg. No. 54,358
Customer Number 33072
Phone: 651-275-9831
Facsimile: 651-351-2954